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Career Entry and Success After Tertiary Vocational Education

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Abstract

Using the Swiss Graduate Survey, we study how the type of tertiary education an individual chooses (i.e., vocational or academic) influences career entry and labor market success after graduation. Our results show that vocational graduates face less risky career entry than academic graduates. Considering endogenous educational choice by using parental education as an instrument, we find higher returns for vocational tertiary education. In the longer term, initial educational type effects disappear, so vocational and academic graduates face the same risk and return. Therefore, career entry for vocational graduates compares favorably to that of academic graduates, while career success for both educational types equalizes over time.

Key Words: Tertiary education, vocational education, career entry, educational screening

JEL Classification: I21, I23, J24

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1. Introduction

In the context of a general labor market trend towards higher education and training requirements, tertiary education becomes more and more important. On the one hand, we know that tertiary education provides advantages over lower-level education during working life (cf., e.g., Psacharopoulos 1994, Blöndal et al. 2002). On the other hand, we know that career entry after education and first career steps determine an individual's future labor market success (Baker et al. 1994, Oreopoulos et al. 2008, Bachmann et al. 2010). Therefore, career entry after tertiary education is also crucial.

Several studies concerning career entry after education or the school-to-work transition already exist. On the level of secondary education, research shows advantages of vocational education compared to academic education at career entry (e.g., Winkelmann 1996, Ryan 1998, Müller 2005), thus revealing educational type effects. On the tertiary education level, research on subject effects at career entry shows relative advantages of certain fields of study (e.g., Falk and Reimer 2007)[2]. What has not yet been studied is a comparison of career entry after different types of tertiary education, i.e., vocational and academic, across similar fields of study[3].

We focus on career entry and labor market success after tertiary education (ISCED 5A) and distinguish two types of education (i.e., vocational and academic) with equal levels but different approaches. For graduates, the success of career entry after tertiary education is especially important because of the long and costly investment period. With tertiary education as a further career step, they gain access to more demanding and interesting occupations. Moreover, an employer's recruiting strategy is important in a career entry analysis. Finding new employment does not only reflect the outcome of the work-

[2] Further higher education surveys with a focus on subject-specific effects examine only the financial returns to education (e.g., Blundell et al. 2000, Ammermüller and Weber 2005, Wahrenburg and Weldi 2007).

[3] Research on effects of tertiary educational types already exists but mostly focuses only on financial returns to education. For Switzerland, Weber (2003) finds lower returns of education for academic compared to vocational graduates. Pätzmann (2005) analyzes type-specific career entry in her thesis, but only for graduates in architectural studies or management, and focuses not only on income but also on difficulties during the job search and on adequacy of employment. For Germany, Riphahn et al. (2010) and Lauer and Steiner (2001) find higher labor market returns for academic education compared to vocational education but do not analyze labor market risk.

worker's choice from among several job offers but is also the result of an employer's choice from several applicants (Barron et al. 1985). Because the hiring process requires increased effort the higher the educational level of the work force is (van Ours and Ridder 1992), employers who search for highly qualified workers thoroughly screen potential employees. Our expectation, therefore, is that the type of education influences career entry in different ways. Thus, in view of the increasing importance of tertiary education, individual career entry and success after different types of tertiary education is a crucial research issue. Furthermore, a comparison of vocational and academic tertiary education is an important policy issue, particularly in an international comparison with different educational systems.

Educational systems differ in terms of favoring specialized vocational education or general academic education. Whereas the educational system of the United States, for example, focuses on academic education (high school and college) and avoids early tracking, in Europe, academic education and vocational education and training often coexist on the secondary and tertiary education levels. Within the US system of post-secondary education, most students acquire general academic skills at colleges. The provision of vocational skills has been largely limited to community colleges, which offer vocational programs designed to prepare students for work immediately after graduation (Bailey and Berg 2010). In contrast, in many European countries, the educational system consists of parallel branches of vocational and academic education. On the tertiary level, universities provide students with academic skills, whereas universities of applied sciences impart students with vocational skills. Therefore, the acquired skills depend on the type of education chosen within an educational system.

As a theoretical framework, we can use Stiglitz's (1975) educational screening. In the second part of his seminal article, Stiglitz states the importance of educational institutions as direct screening devices. We thus investigate how the type of tertiary education chosen (i.e., vocational or academic) influences individual career entry after graduation. If employers value the tertiary education types differently, we expect different career entry effects, i.e., screening effects. Moreover, we study whether educational screening becomes less important after gaining work experience in a company, causing educational type effects to diminish.

Our empirical results show that the type of tertiary education chosen influences risk and return at career entry in different ways. Vocational tertiary graduates face less risky career entry than academic graduates do (in terms of unemployment risk, favorable job characteristics and wage variance), but also a less profitable one in monetary terms. Considering endogenous educational choice by using parental academic tertiary education as an instrument, we find higher wage expectations with still lower risks for vocational graduates. In the longer term, initial educational type effects disappear, so vocational and academic tertiary education graduates face the same risk and return. Therefore, in line with the screening hypothesis, it appears that initial screening effects fade over time.

The remainder of this paper is structured as follows. Section 2 derives testable hypotheses regarding career entry and success after different types of tertiary education. Section 3 explains our estimation methods, and Section 4 introduces the data set. Section 5 presents our empirical results, and Section 6 concludes.

2. Theoretical framework

Screening theory (Stiglitz 1975) states that employers screen potential employees to find out more about their qualities because the former have only imperfect information about the latter's productive ability. During a hiring process, an employer wants to learn more about the quality of a potential employee because individuals vary widely in their productive ability.

Stiglitz (1975: 292) further states, in the second section of his seminal article, that educational screening is important. Especially at career entry, an employer will not be able to evaluate the productivity of a prospective employee. Employers with only limited information about the quality of workers in the early stages of their careers distinguish among workers on the basis of easily observable variables that are correlated with productivity. Therefore, they screen potential employees to assess their productivity and use each individual's educational path as a screening device, that is, they apply educational screening. Because the educational institution attended provides further information about individuals, in addition to a worker's educational level or field of study cho-

sen, the *type* of education chosen contains crucial information. A screening mechanism, therefore, is the individual educational path, i.e., the level, field or type of education chosen. In the following, we focus on the type of tertiary education as a screening device and apply educational screening to tertiary education.

Especially after graduation from tertiary education, employers have only limited information about the quality of a graduate's work. Employers can use observable characteristics such as the type of tertiary education completed as screening devices. The types of tertiary education differ in their educational goals: Vocational tertiary education places a greater emphasis on practically oriented studies, includes elements of general vocational training and takes a more practice-oriented approach than academic tertiary education does (SKBF 2010).

If employers value the two types of tertiary education differently, we can observe different effects on career entry after graduation. On the one hand, employers could value academic knowledge more than practical training on the tertiary level and thus prefer academic education, which shows that candidates have a high general cognitive capacity for learning new skills and adapting to a new technical environment. On the other hand, employers could favor the practice-oriented approach with achievement of vocational skills and prefer vocational tertiary education because those graduates already have some expertise in the necessary tasks. Therefore, the labor market value that employers attach to these two educational types influences career entry (in terms of how quickly first employment is found, the nature of the position and its conditions). This consideration leads us to our first hypothesis:

H1: The type of tertiary education chosen, i.e., vocational or academic, influences risk and return at career entry differently.

Because educational screening becomes less important after gaining some work experience, the influence of the screening devices should diminish or even completely disappear for more experienced employees. As the work experience of graduates accumulates, employers accumulate better information about their employees' real productivity (Layard and Psacharopoulos 1974, Riley 1976) and thus do not rely on their initial

screening devices, such as the educational path, any longer. Therefore, if employers use the type of tertiary education only as screening device at career entry for a lack of more precise information, the short-term and longer-term type effects should differ because of diminishing screening effects. Therefore, we expect labor market effects to cease to differ between these two types of tertiary education in the longer term.

H2: The type of tertiary education chosen, i.e., vocational or academic, does not influence risk and return differently in the longer term.

This theoretical expectation is also in line with employer learning (Altnoji and Pierret 2001, Farber and Gibbons 1996, Lange 2007). Upon career entry, employers have to use easily observable variables such as schooling to judge the productivity of a potential employee. After employees have gained some experience in the labor market, these variables become less important as employers cease to rely on schooling to predict productivity. Employers observe workers' performance on the job and thus learn about their unobserved ability. Therefore, when employees have gained some experience, productivity effects prevail.

3. Estimation methods

In our empirical analysis, we investigate the risk and return of educational types in the short term (at career entry after graduation) as well as in the longer term (five years after graduation). We analyze three different labor market outcome categories: (1) unemployment risk, (2) job characteristics and (3) earnings, and apply three different specifications. In the first specification, the basic equation we use to test educational type effects can be written as

$$y_i = \alpha_1 + \beta_1 VocTertEduc_i + \gamma_1 X_i + \varepsilon_i, \quad (1)$$

where *y* stands for various labor market outcomes. Our main explanatory variable *VocTertEduc* is a dummy representing vocational tertiary education, so β_1 is the influence of vocational tertiary education on the outcome variable. The reference group in our

analysis is academic tertiary education. Additionally, we include *X*, a vector of control variables. ε represents an unobservable error.

In the second specification, we estimate regressions without career-related variables that occurred after graduation. With this approach, we intend to measure the whole effect of the tertiary education type because all post-graduation variables are part of the type effect and thus would bias the main effect[4].

In the third specification, we instrument the variable vocational tertiary education with the parent's education to avoid endogeneity problems (Angrist and Krueger 2001). As previous literature shows, a parent's educational path influences her child's path (for an overview, see Björklund and Salvanes 2010; for Switzerland, see Cattaneo et al. 2007, Bauer and Riphahn 2007). Parental education is therefore clearly related to a child's educational path and especially to the type of education the child chooses, i.e., vocational or academic tertiary education. However, parental education is not directly related to a child's career entry because individual characteristics prevail. Thus, because the parental education is highly correlated with an individual's educational path but not with its labor market outcome, we can use the parent's highest educational degree as an instrumental variable (IV). As an IV we include a dummy taking the value of 1 if one or both of the parents graduated from university, and thus chose academic tertiary education[5], or 0 if neither of the parents graduated from university. Our IV equation can thus be written as

$$y_i = \alpha_2 + \beta_2 VocTertEduc_i * + \gamma_2 X_i + \varepsilon_i, \tag{2}$$

$$VocTertEduc_i * = \alpha_3 + \delta_3 ParentAcadTertEduc_i + \gamma_3 X_i + \varepsilon_i. \tag{3}$$

We estimate probit regressions (Wooldridge 2009: 575-578) in case of unemployment risk and job characteristics. The earnings equations are basically an extended Mincer (1974) earnings equation specified as an OLS regression.

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[4] Pereira and Martins (2001) show that including covariates that represent post-educational decisions results in an underestimation of the impact of education.

[5] Riphahn et al. (2010) also use the parents' educational attainment, among other variables, to predict graduation from university compared to graduation from a university of applied sciences. A university degree held by either parent significantly increases the probability that the child will attend university.

4. Educational system, data and variables

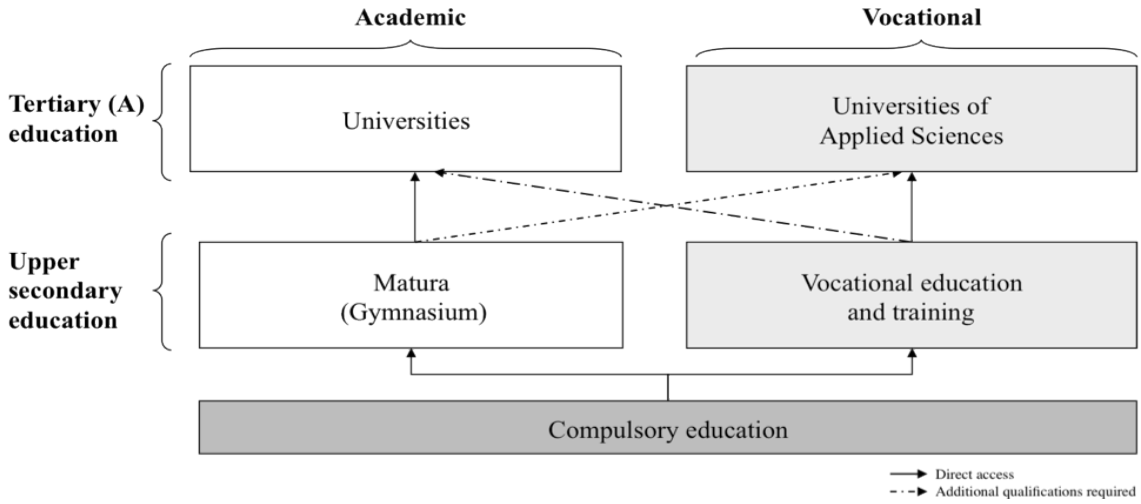
In this chapter, we give an overview of the Swiss educational system, which consists of parallel branches of vocational and academic education and is thus a particularly interesting context in which to study our research question. Furthermore, we describe the data and variables used in this analysis.

Swiss educational system

The educational system in Switzerland is based on different tracks of vocational and academic education (cf. Figure 1, which gives a simplified diagram of the Swiss educational system[6]). Having completed nine years of compulsory school, two thirds of each youth cohort choose to pursue vocational secondary education (OPET 2009). Vocational secondary graduates have the option of continuing their education and attending a university of applied sciences (a type of university that focuses on practically oriented studies and applied research), i.e., *vocational tertiary education.* Otherwise, youths can stay in the school system after completing their compulsory education by attending academic secondary education in a Gymnasium (a university preparatory upper secondary school) and obtaining a Matura (a baccalaureate). This certificate grants access to *academic tertiary education*, i.e., to all academic universities at the tertiary education level. Switching tracks within the educational system and thereby combining academic and vocational education is possible, but usually only after the acquisition of additional qualifications.

Figure 1: Simplified diagram of the Swiss educational system

[6] A detailed description of the educational system in Switzerland can be found in Weber et al. (2001: 285-287).



In Switzerland, the institutes of tertiary education can thus be separated into two types: traditional universities and universities of applied sciences (SKBF 2010). These two types of institutions have the same status but different educational goals. Traditional universities carry out basic research and teaching, whereas universities of applied sciences place a greater emphasis on practically oriented studies and on applied research. Therefore, universities of applied sciences have the same educational goals as universities do but incorporate elements of general vocational training and take a more practice-oriented approach through a close link between teaching and research. Thus, the two different educational goals can result in different labor market values of these two educational types.

Data

In our empirical analysis, we use data from a representative survey of Swiss graduates of tertiary education (ISCED 5A[7]) conducted by the Swiss Federal Statistical Office. The cohort we look at graduated in the year 2000 and was surveyed for the first time one year after graduation (in 2001) and a second time five years after graduation (in

[7] Tertiary-type A programs (ISCED 5A) are largely theory-based and are designed to provide qualifications for entry into professions with high skill requirements and advanced research programs compared to tertiary-type B programs (ISCED 5B), which are classified as being at the same competency level but are more occupationally oriented and usually of shorter duration (OECD 2009).

2005). This panel design allows us to analyze educational type effects at career entry as well as in the longer term. The survey is well suited for our analysis because it contains detailed and unique information on each graduate's educational path at the secondary and tertiary levels as well as on his or her career path before, during and after studies.

For our analysis, we exclude all graduates who reported having been part-time students in the last years of their studies[8]. We include only graduates of similar fields of study that are taught at both types of tertiary education institutes (i.e., business/economics, technical, natural and social sciences) to study the educational type effects within these fields. We thus ignore graduates of fields of study that are offered either only at a university of applied sciences (such as arts or design) or only at an academic university (such as medical science or law). Furthermore, we exclude individuals who reported being self-employed. After eliminating observations with missing data, a sample of 1,920 individuals remained in our first analysis of unemployment risk. Because the further equation estimates are conditional on working, graduates who were unemployed at the times of the surveys - one year and/or five years after graduation - are excluded from further analysis, leading to a smaller sample.

Variables

We analyze various dependent variables of three categories of labor market outcomes. In a first step, we analyze the *unemployment risk* after different types of tertiary education. On the one hand, we are interested in the unemployment incidence after graduation. As the graduates had to declare their employment status one year after graduation, we generate a dummy variable indicating unemployment (1 if unemployed in 2001, 0 otherwise). The same applies to unemployment in the longer term in 2005, five years after graduation. On the other hand, we are interested in the unemployment duration, that is, the time span (in months) between graduation and beginning employment. The

[8] This requirement applies only to vocational tertiary education. The studies offered at universities of applied sciences are either full-time three-year courses or four-year courses if the student only studies part-time. The main activity of part-time students is working. Their employers often partly or fully finance their studies, and these students are contractually bound to remain employed with the firm for a certain amount of time after graduation. Therefore, career entry after graduation is not comparable between part-time and full-time vocational graduates, and we focus on full-time students in our analysis.

graduates were required to indicate the length of their unemployment from graduation until the start of their first job[9].

In a second step, we investigate educational type effects on the *job characteristics* of the graduate's employment. Because individuals strive to obtain jobs that promise security or status, not only getting a job after graduation is important; the nature of the first employment also matters (Müller 2005, Fehse and Kerst 2007). We analyze separately the probabilities of having a permanent job and of being in a managerial position in the short term at career entry as well as in the longer term five years after graduation. The graduates were asked if their employment contract was permanent or temporary. We generate a dummy that takes the value 1 if the employment is permanent and 0 otherwise. Furthermore, the graduates had to provide their employment status. If a graduate was employed in a managerial position, the dummy takes the value of 1, 0 otherwise.

In a third step, we investigate the *income* of tertiary education graduates. We not only analyze the level of income one year after graduation but also the income risk because education both raises expected wages and influences wage variances (Christiansen et al. 2007)[10]. The survey collected self-reported annual gross earnings in 2001, one year after graduation[11]. We first use the logarithm of yearly wages as a dependent variable to analyze the level of income. Second, to investigate the income risk, we compute for each graduate the variance of earnings following Firpo et al. (2007: 24):

$$\operatorname{var} y_i = (y_i - \bar{y})^2 \qquad (4).$$

For the ease of interpretation we transform the resulting variance, dividing it by 1000. The same procedure applies to the income and income risk five years after graduation in 2005. In the second interview in 2005, the graduates had to report their actual monthly gross earnings. To get comparable annual gross earnings, we multiply the monthly earnings by thirteen.

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[9] The unemployment time span is observed as a categorical variable. To simplify the interpretation, we assigned midpoints to these categories and treated the variables as continuous (following DiNardo and Pischke 1997).

[10] Greater earnings risk after education requires higher expected returns (Hartog and Vijverberg 2007).

[11] We use the information at the level of employment to calculate the corresponding full-time salaries of part-time workers. Furthermore, we drop observations with earnings above the 99th percentile or below the 1st percentile for each year so that the results are not determined by outliers.

Our primary explanatory variable is *vocational tertiary education*, which indicates the type of tertiary education an individual successfully completed. The dummy takes the value 1 for vocational tertiary education (i.e., studies at a university of applied sciences) and 0 for academic tertiary education (i.e., studies at a traditional university). Our sample consists of 30% vocational and 70% academic tertiary education graduates.

We furthermore use a full set of controls. We include socio-demographic factors such as being male (dummy), age and age squared (in years), having children (dummy) and Swiss nationality (dummy) as well as various characteristics regarding the graduate's study, such as the field of study (4 dummies), duration of study (in terms) and the final grade[12]. We include various controls for the earlier educational and career paths of the graduates. Regarding earlier education, we differentiate the type and level of the previous schooling. We include dummies for secondary vocational education, secondary academic education and mixed secondary education (i.e., both types of education at the secondary level) as well as a dummy for an already successfully completed tertiary education. Regarding the earlier career path, we control for mandatory practical training during studies (dummy), student employment (in years), and a stay abroad during studies (dummy).

Moreover, we include a motivation proxy as an individual intrinsic characteristic because this may affect a graduate's later labor market success (Wenz and Yu 2009). We choose a variable indicating the importance of a new challenge as a desire for personal achievement. This variable is measured on a five-point scale. It takes the value of 1 if a new challenge is not at all important and a value of 5 if it is very important. As a result, a higher value of this variable indicates the greater importance of a new challenge and the greater motivation of the individual. Furthermore, we include the respective local unemployment rate as a labor market control. We also include career-related variables that occurred after graduation from tertiary education (except for our second specification without post-graduation variables). We control for a stay abroad after studies (dummy), unemployment duration after graduation (in months) and working in the pub-

[12] We standardize the reported final grades so that they range from 0 to 1, where 0 corresponds to the minimum passing grade and 1 corresponds to the maximum achievable grade (Schweri 2004).

lic sector (dummy). For the longer-term analyses, we moreover include experience after graduation (in years) and an employer change (dummy).

Looking at the descriptive statistics (table A.1 in the appendix), we can compare characteristics of vocational and academic tertiary education graduates. Vocational graduates are generally younger and more likely to come from vocational secondary education. Overall, the parents' education is lower for vocational than for academic graduates. Parents of vocational graduates often only completed vocational secondary education, whereas parents of academic graduates are more likely to have an academic tertiary degree. Regarding the career entry outcome variables, we find a lower unemployment risk, more favorable job characteristics and a higher wage for vocational compared to academic graduates. Thus, purely descriptively, the career entry of vocational graduates appears to be advantageous. In the longer term, five years after graduation, still more favorable job characteristics exist, although the wage of vocational graduates is lower than that of academic graduates. We further check the findings of this basic descriptive analysis in the next chapter in a multivariate analysis.

5. Empirical results

We now discuss the key results concerning the educational type effects at career entry in the short term as well as later on in the longer term. We use various labor market outcomes to test our hypotheses and apply our three different specifications.

First specification: Basic equation

We begin by studying type effects at career entry, that is, the short-term labor market effects after tertiary education (table 1). In a first step, we investigate unemployment risk and start with the unemployment incidence in the year after graduation (column 1), estimating a probit model with the dependent variable of being unemployed in 2001. We do not find a significant effect of the type of tertiary education; that is, there is no different probability of being unemployed one year after graduation from vocational compared to academic tertiary education. The fields of study, the former career path as well as the local unemployment rate are more important factors than the educational

type in determining the unemployment incidence. When we analyze the unemployment duration (column 2), we find a significant negative effect of vocational education on the time span between graduation and starting employment. Therefore, vocational graduates find employment faster after their studies than do academic graduates.

Table 1: Educational type effects at career entry: Basic equation

	1. Unemployment Risk		2. Job Characteristics		3. Income	
	Unemployment Incidence	Unemployment duration	Permanent Job	Managerial Function	Income (in logs)	Income Risk
	(1)	(2)	(3)	(4)	(5)	(6)
	Probit	OLS	Probit	Probit	OLS	OLS
Vocational tertiary education	0.0522	-0.829***	0.131*	0.0638**	-0.0385*	-21,433***
	[0.0370]	[0.249]	[0.0707]	[0.0279]	[0.0218]	[3,777]
Social sciences	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
Business/Economics	-0.100***	0.0874	0.378***	0.0600***	0.119***	3,376
	[0.0366]	[0.229]	[0.0554]	[0.0215]	[0.0203]	[4,842]
Technical sciences	-0.157***	-0.238	0.226***	0.0480**	0.0202	-507.3
	[0.0438]	[0.226]	[0.0488]	[0.0221]	[0.0218]	[4,181]
Natural sciences	-0.0711**	-0.417*	0.0234	0.0430**	-0.0286	9,485**
	[0.0323]	[0.224]	[0.0443]	[0.0202]	[0.0232]	[4,438]
Secondary academic education	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
Secondary vocational education	-0.0699*	0.0901	0.0862	-0.0148	0.0577***	4,960
	[0.0424]	[0.251]	[0.0694]	[0.0243]	[0.0198]	[3,213]
Secondary mixed education	-0.153	-0.436	0.0789	0.0308	0.110***	7,311
	[0.103]	[0.324]	[0.130]	[0.0435]	[0.0309]	[8,949]
Tertiary education	-0.125*	0.319	-0.00522	0.0454	0.110***	549.1
	[0.0681]	[0.392]	[0.0763]	[0.0319]	[0.0262]	[7,197]
Practical training during studies	-0.0418*	0.0594	0.0497	0.0184	-0.0159	5,788**
	[0.0225]	[0.134]	[0.0311]	[0.0129]	[0.0129]	[2,305]
Student employment	-0.0140**	-0.113***	0.0179**	0.0124***	0.0155***	202.8
	[0.00575]	[0.0362]	[0.00827]	[0.00417]	[0.00322]	[579.6]
Stay abroad during studies	0.0210	-0.108	0.0269	0.0183	0.0248*	-1,503
	[0.0179]	[0.142]	[0.0325]	[0.0137]	[0.0137]	[2,714]
Motivation	-0.000614	-0.105	0.00428	0.0211**	-0.00331	1,689
	[0.0106]	[0.0885]	[0.0189]	[0.0101]	[0.00773]	[1,381]
Local unemployment rate 2001	0.0457***	-0.0751	-0.0329*	0.00424	-0.0217**	1,214
	[0.0123]	[0.0886]	[0.0197]	[0.00945]	[0.00926]	[1,839]
Stay abroad after studies	0.0402**	0.291*	-0.00360	-0.0175	0.00957	3,874*
	[0.0187]	[0.151]	[0.0321]	[0.0151]	[0.0130]	[2,150]
Unemployment duration after graduation			0.00964	-0.00161	-0.00411	-936.2**
			[0.00595]	[0.00289]	[0.00252]	[398.1]
Permanent job					0.210***	-20,158***
					[0.0185]	[3,038]
Managerial function					0.0593***	9,250**
					[0.0143]	[3,697]
Public sector					-0.0140	-4,341
					[0.0171]	[2,959]
Constant		2.364			10.82***	107,638*
		[2.457]			[0.259]	[60,012]
Socio-demographic controls	yes	yes	yes	yes	yes	yes
Study controls	yes	yes	yes	yes	yes	yes
Observations	1,920	1,446	1,446	1,446	1,446	1,446
R-squared	0.098	0.039	0.152	0.050	0.327	0.125

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%; probit coefficients represent marginal effects; robust standard errors col. 1 - 5; bootstrapped standard errors col. 6.

Source: Swiss Graduate Study 2000; own calculations.

In a second step, we analyze the employment characteristics and estimate probit models. As we condition on employment in the following models, we have to exclude unemployed individuals from the analysis, thus reducing the sample size. In column 3, we investigate the probability of working on the basis of a permanent contract compared to

being employed on temporary contracts. Vocational graduates have a significantly higher probability of being permanently employed than do academic graduates. Furthermore, we analyze the probability of being employed in a managerial position; vocational graduates have a significantly higher probability of being a team leader than do academic graduates (column 4). Therefore, vocational graduates start in jobs with more favorable characteristics than do academic graduates.

In a third step, we study income effects of different tertiary education types and estimate ordinary least squares (OLS) regressions. Concerning income level effects, we find a significant negative impact of vocational tertiary education (column 5), a wage reduction of 3.8%. However, the income variance of vocational graduates is also significantly lower (column 6). Thus, vocational graduates face a lower financial return[13] but also a lower financial risk than academic graduates do.

Summing up our first empirical findings concerning career entry, we conclude that educational type effects (or potential screening effects) exist; employers appear to favor vocational tertiary education as it leads to a less risky career entry than academic tertiary education does. This preference is shown in a faster transition into employment after graduation for vocational tertiary education graduates, a higher probability of their getting a job with more favorable characteristics such as a permanent contract and managerial responsibility, as well as a lower income risk. However, graduates of vocational tertiary education also face lower income expectations than academic graduates do. These findings thus support our hypothesis H1, where we expect different educational type effects on risk and return at career entry.

Next, we analyze longer-term labor market effects (five years after graduation) to investigate the persistence of potential educational screening effects (table 2). First, we again investigate the unemployment risk and estimate a probit model with the dummy of being unemployed in 2005 as the dependent variable (column 1). We find no different effects of the educational type on the probability of being unemployed five years after graduation. However, factors that significantly reduce unemployment risk in the longer

[13] However, at this point we have to bear in mind that in Switzerland vocational tertiary graduates in general spend 1-2 years less in education than academic tertiary graduates do, and the average rate of return to a year of education is about 6% (Weber and Wolter 1999). Taking this fact into account, the wage effects of vocational tertiary education look fairly advantageous.

term are having completed secondary vocational education before tertiary studies as well as post-graduation variables such as experience after graduation and having changed employers.

Table 2: Educational type effects in the longer term: Basic equation

	1. Unemployment Risk	2. Job Characteristics		3. Income	
	Unemployment Incidence	Permanent Job	Managerial Function	Income (in logs)	Income Risk
	(1) Probit	(2) Probit	(3) Probit	(4) OLS	(5) OLS
Vocational tertiary education	0.0445	0.126	-0.0112	-0.0977***	-16,777***
	[0.031]	[0.087]	[0.039]	[0.019]	[5,025]
Social sciences	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
Business/Economics	-0.0253	0.234***	0.215***	0.129***	23,469***
	[0.0302]	[0.0642]	[0.0368]	[0.0160]	[4,700]
Technical sciences	0.0244	0.172***	0.191***	0.00948	3,623
	[0.0256]	[0.0539]	[0.0371]	[0.0165]	[4,317]
Natural sciences	0.0450**	-0.0470	0.0766**	0.0118	8,122**
	[0.0221]	[0.0408]	[0.0299]	[0.0161]	[3,801]
Secondary academic education	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
Secondary vocational education	-0.0811**	0.0487	0.0438	0.0459***	8,279**
	[0.0354]	[0.0820]	[0.0377]	[0.0169]	[4,026]
Secondary mixed education	-0.00204	0.0631	0.0850	0.00685	14,316
	[0.0454]	[0.155]	[0.0696]	[0.0339]	[8,982]
Tertiary education	-0.0110	0.0459	-0.00900	0.0431*	15,081
	[0.0412]	[0.0803]	[0.0483]	[0.0231]	[10,723]
Practical training during studies	-6.86e-05	0.0254	0.0133	-0.00491	1,792
	[0.0163]	[0.0313]	[0.0193]	[0.00955]	[2,563]
Student employment	-0.00506	0.0160*	0.0184***	0.0101***	475.6
	[0.00425]	[0.00836]	[0.00522]	[0.00255]	[718.6]
Stay abroad during studies	0.0238	0.0466	0.0202	0.00257	175.6
	[0.0163]	[0.0329]	[0.0204]	[0.0101]	[2,994]
Motivation	-0.0133	0.0149	0.0387***	0.0150**	2,306
	[0.00930]	[0.0183]	[0.0136]	[0.00625]	[1,839]
Local unemployment rate 2005	-0.00533	-0.0165	-0.00494	-0.00452	370.5
	[0.00687]	[0.0118]	[0.00836]	[0.00407]	[1,071]
Stay abroad after studies	-0.00631	-0.00999	0.0303	0.0141	3,380
	[0.0177]	[0.0316]	[0.0200]	[0.00988]	[3,289]
Employer change	-0.0392*	-0.00751	-0.000831	-0.0119	3,330
	[0.0208]	[0.0287]	[0.0182]	[0.00872]	[2,364]
Experience after graduation	-0.0723***	0.0230	0.0273**	0.0298***	2,004
	[0.0201]	[0.0201]	[0.0135]	[0.00607]	[1,274]
Permanent job				0.135***	-8,007**
				[0.0159]	[3,640]
Managerial function				0.0524***	5,088*
				[0.00917]	[2,817]
Public sector				0.00131	-1,661
				[0.0113]	[2,952]
Constant				10.50***	-2,971
				[0.225]	[69,408]
Socio-demographic controls	yes	yes	yes	yes	yes
Study controls	yes	yes	yes	yes	yes
Observations	1,920	1,446	1,446	1,446	1,446
R-squared	0.183	0.149	0.069	0.285	0.064

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%; probit coefficients represent marginal effects; robust standard errors col. 1 - 5; bootstrapped standard errors col. 6.

Source: Swiss Graduate Study 2000; own calculations.

Second, we investigate job characteristics in the longer term after graduation from tertiary education. We start again with the dummy of having a permanent job as the dependent variable (column 2) and find no significant different type effect five years after graduation. Also, when analyzing the probability of a managerial position (column 3), we no longer find significantly different type effects. Rather, the field of study and career-related variables have significant effects on job characteristics. Therefore, in the longer term, employment characteristics of vocational and academic graduates do not differ.

Third, we study educational type effects on the longer-term income and estimate OLS regressions. Our results show that vocational graduates earn a significantly lower income than do academic graduates five years after graduation (column 4), a 9.8% wage reduction[14]. However, vocational tertiary education still has a significant negative impact on the income variance, thus reducing the income risk compared to academic tertiary education (column 5). So, in the longer term as well, vocational graduates have a lower income expectation but also a lower income risk than do academic graduates.

Overall, we no longer find different effects of the two educational types on unemployment risk or job characteristics in the longer term compared to the former significant type effects at career entry. Thus, our findings support our second hypothesis H2, where we expect educational type effects to disappear in the longer term. Thus, educational screening effects do not persist and disappear after graduates have spent some time in the labor market. However, we do find significantly different income effects of the two educational types in the longer term. These effects can be explained with the average returns to (fewer) educational years of vocational graduates compared to academic graduates.

Second specification: Analysis without post-graduation variables

[14] Taking into account again the average returns to (fewer) educational years of vocational graduates, the wage effects approximately level out.

To measure the whole effect of the tertiary education type, we further estimate regressions without career-related variables that occurred after graduation. This approach reduces bias if post-graduation variables are part of the effect of the educational type.

Table 3: Educational type effects at career entry: Without post-graduation variables

	1. Unemployment Risk		2. Job Characteristics		3. Income	
	Unemployment Incidence	Unemployment Duration	Permanent Job	Managerial Function	Income (in logs)	Income Risk
	(1)	(2)	(3)	(4)	(5)	(6)
	Probit	OLS	Probit	Probit	OLS	OLS
Vocational tertiary education	0.0478	-0.856***	0.124*	0.0633**	-0.00994	-21,599***
	[0.039]	[0.251]	[0.071]	[0.027]	[0.023]	[3,813]
Social sciences	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
Business/Economics	-0.102***	0.0987	0.380***	0.0566***	0.191***	-128.5
	[0.0376]	[0.230]	[0.0555]	[0.0203]	[0.0211]	[4,751]
Technical sciences	-0.161***	-0.216	0.223***	0.0447**	0.0737***	-2,404
	[0.0444]	[0.225]	[0.0489]	[0.0208]	[0.0233]	[4,511]
Natural sciences	-0.0755**	-0.414*	0.0194	0.0415**	-0.0188	10,493**
	[0.0336]	[0.225]	[0.0443]	[0.0192]	[0.0253]	[4,586]
Secondary academic education	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
Secondary vocational education	-0.0718	0.0964	0.0866	-0.0144	0.0708***	3,662
	[0.0440]	[0.254]	[0.0696]	[0.0232]	[0.0212]	[2,971]
Secondary mixed education	-0.165	-0.440	0.0722	0.0302	0.132***	6,927
	[0.108]	[0.319]	[0.130]	[0.0416]	[0.0340]	[9,828]
Tertiary education	-0.136*	0.280	-0.000267	0.0453	0.113***	380.5
	[0.0709]	[0.391]	[0.0762]	[0.0306]	[0.0311]	[5,775]
Practical training during studies	-0.0441*	0.0509	0.0508	0.0177	-0.00379	5,002**
	[0.0233]	[0.135]	[0.0311]	[0.0123]	[0.0143]	[2,264]
Student employment	-0.0145**	-0.112***	0.0170**	0.0119***	0.0207***	184.7
	[0.00592]	[0.0361]	[0.00820]	[0.00399]	[0.00345]	[671.7]
Stay abroad during studies	0.0251	-0.0938	0.0259	0.0167	0.0328**	-1,432
	[0.0188]	[0.142]	[0.0325]	[0.0130]	[0.0150]	[2,728]
Motivation	0.00210	-0.0864	0.00332	0.0193**	-0.000518	2,386
	[0.0110]	[0.0874]	[0.0188]	[0.00942]	[0.00819]	[1,567]
Local unemployment rate 2001	0.0485***	-0.0643	-0.0336*	0.00355	-0.0266***	2,081
	[0.0126]	[0.0877]	[0.0198]	[0.00901]	[0.00991]	[1,858]
Constant		2.528			10.62***	108,817**
		[2.454]			[0.274]	[54,418]
Socio-demographic controls	yes	yes	yes	yes	yes	yes
Study controls	yes	yes	yes	yes	yes	yes
Observations	1,920	1,446	1,446	1,446	1,446	1,446
R-squared	0.094	0.036	0.151	0.049	0.192	0.088

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%; probit coefficients represent marginal effects; robust standard errors col. 1 - 5; bootstrapped standard errors col. 6.

Source: Swiss Graduate Study 2000; own calculations.

Overall, we find the same educational type effects in our second specification without post-graduation variables as we do in our first basic specification. The results of our second specification at career entry (table 3) show the same probability of being unemployed one year after graduation (column 1), a shorter unemployment duration (column 2), more favorable job characteristics (columns 3 and 4) as well as a lower income variance (column 6) for vocational compared to academic graduates. An exception is the income level at career entry (column 5), where vocational education does not evoke a different effect than academic education does (compared to the negative effect of vocational education in the first basic specification). The exclusion of career-related vari-

ables such as employment characteristics (which are more favorable for vocational than for academic graduates) explains this wage catch-up of vocational graduates.

Table 4: Educational type effects in the longer term: Without post-graduation variables

	1. Unemployment Risk	2. Job Characteristics		3. Income	
	Unemployment Incidence	Permanent Job	Managerial Function	Income (in logs)	Income Risk
	(1)	(2)	(3)	(4)	(5)
	Probit	Probit	Probit	OLS	OLS
Vocational tertiary education	0.0663**	0.122	-0.0201	-0.0998***	-17,918***
	[0.032]	[0.087]	[0.040]	[0.020]	[3,765]
Social sciences	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
Business/Economics	-0.0513	0.238***	0.223***	0.165***	24,477***
	[0.0325]	[0.0640]	[0.0363]	[0.0158]	[3,816]
Technical sciences	-0.00596	0.179***	0.205***	0.0473***	5,260
	[0.0257]	[0.0543]	[0.0370]	[0.0164]	[4,061]
Natural sciences	0.0423*	-0.0476	0.0795***	0.0106	9,255**
	[0.0221]	[0.0412]	[0.0308]	[0.0170]	[3,820]
Secondary academic education	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
Secondary vocational education	-0.0801**	0.0483	0.0439	0.0516***	8,205*
	[0.0358]	[0.0833]	[0.0391]	[0.0182]	[4,198]
Secondary mixed education	-0.00218	0.0730	0.0953	0.0296	14,561
	[0.0468]	[0.156]	[0.0718]	[0.0375]	[8,938]
Tertiary education	-0.0134	0.0454	-0.0148	0.0459*	14,493*
	[0.0414]	[0.0820]	[0.0496]	[0.0258]	[8,210]
Practical training during studies	0.00152	0.0242	0.0118	-0.00353	1,708
	[0.0158]	[0.0315]	[0.0199]	[0.0103]	[3,023]
Student employment	-0.00898*	0.0159*	0.0191***	0.0131***	546.3
	[0.00488]	[0.00845]	[0.00529]	[0.00270]	[914.4]
Stay abroad during studies	0.0145	0.0456	0.0213	0.00780	370.1
	[0.0161]	[0.0331]	[0.0210]	[0.0109]	[2,545]
Motivation	-0.0112	0.0132	0.0411***	0.0177***	2,892
	[0.00962]	[0.0186]	[0.0136]	[0.00632]	[1,930]
Local unemployment rate 2005	0.00260	-0.0180	-0.00563	-0.00783*	470.0
	[0.00611]	[0.0119]	[0.00864]	[0.00436]	[943.8]
Constant				10.56***	-2,731
				[0.232]	[59,393]
Socio-demographic controls	yes	yes	yes	yes	yes
Study controls	yes	yes	yes	yes	yes
Observations	1,920	1,446	1,446	1,446	1,446
R-squared	0.051	0.148	0.066	0.176	0.057

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%; probit coefficients represent marginal effects; robust standard errors col. 1 - 5; bootstrapped standard errors col. 6.

Source: Swiss Graduate Study 2000; own calculations.

In the longer term, as well, we find similar effects to those in our first basic specification (table 4). Vocational tertiary education leads to the same job characteristics (columns 2 and 3) but lower income expectations (column 4) and lower income variance (column 5) compared to academic tertiary education. A different effect is obtained for the unemployment risk in the longer term, where vocational graduates face a higher unemployment risk than academic graduates do (compared to no significantly different effects in the full specification). The exclusion of career-related variables with significant negative effects on unemployment, such as an employer change or experience after

graduation (which occur less often for vocational than for academic graduates), explains this higher risk for vocational graduates. Therefore, the analysis with the second specification confirms our prior findings of favorable career entry for vocational tertiary education graduates with diminishing type effects.

Third specification: IV estimation

Finally, we instrument the variable vocational tertiary education to account for potential endogeneity of the educational path chosen (tables 5 and 6)[15]. Because the F-value of the first stage exceeds the value of 10 for all regressions, we do not have a problem of weak instruments (Yogo 2004). The significant and strong negative effect of the dummy *parents with academic tertiary education* on our main explanatory variable, *vocational tertiary education,* indicates that the instrument is a reasonably powerful predictor. If one or both parents graduated from academic tertiary education, the probability of the child's choosing vocational tertiary education compared to academic is much smaller. Note that the IV provides an estimate only for those individuals whose behavior can be manipulated (local average treatment effect or LATE, Angrist and Krueger 2001), namely those graduates whose choice of educational type is influenced by their parents' education. Therefore, the IV estimates apply only to those vocational education graduates who chose the vocational path because of their parents (who did not graduate from academic tertiary education) although they would have been able to complete an academic tertiary education compared to those graduates who attended academic tertiary education because their parents also did so.

Our IV regressions still show the same effects for unemployment risk at career entry (table 5); that is, no effects on unemployment incidence (column 1) and a lower unemployment duration (column 2) for vocational compared to academic graduates. In contrast, the IV estimations at career entry show no effects on job characteristics (columns 3 and 4). Furthermore, considering endogenous educational choice, we find a higher expected income (column 5) and a lower income variation (column 6) after vocational

[15] As IV estimates of returns to education based on family background are systematically higher than corresponding OLS estimates (Card 1999), we only interpret the significance and direction of the IV estimates compared to the OLS full specification.

education. Therefore, accounting for intergenerational mobility, vocational graduates earn higher monetary returns. However, they can expect no different non-monetary returns, such as security (permanent contracts) or status (managerial function), compared to academic graduates.

Table 5: Educational type effects at career entry: Instrumental variable estimates

		1. Unemployment Risk		2. Job Characteristics		3. Income	
	Vocational tertiary education	Unemployment Incidence	Unemployment Duration	Permant Job	Managerial Function	Income (in logs)	Income Risk
		(1)	(2)	(3)	(4)	(5)	(6)
	First Stage	IV-Probit	IV-Reg	IV-Probit	IV-Probit	IV-Reg	IV-Reg
Vocational tertiary education		-1.126	-5.648**	1.801	-0.385	0.798**	-136,057**
		[1.376]	[2.555]	[1.395]	[1.542]	[0.335]	[58,876]
Social sciences	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
Business/Economics	0.020	-0.432***	0.0682	0.978***	0.354**	0.134***	-2,311
	[0.024]	[0.138]	[0.275]	[0.144]	[0.144]	[0.0350]	[6,048]
Technical sciences	0.222***	-0.453	0.714	0.342	0.332	-0.112**	15,899*
	[0.024]	[0.341]	[0.478]	[0.255]	[0.283]	[0.0554]	[9,420]
Natural sciences	-0.109***	-0.448**	-0.839**	0.151	0.130	0.0509	-4,752
	[0.023]	[0.201]	[0.399]	[0.204]	[0.234]	[0.0496]	[8,659]
Motivation	-0.016*	-0.0325	-0.211*	0.0496	0.130*	0.0166	-1,088
	[0.009]	[0.0578]	[0.120]	[0.0609]	[0.0691]	[0.0141]	[2,412]
Local unemployment rate 2001	-0.074***	0.148	-0.496*	0.00434	-0.0467	0.0479	-9,993*
	[0.010]	[0.119]	[0.263]	[0.141]	[0.157]	[0.0336]	[5,757]
Stay abroad after studies	-0.052***	0.138	0.0964	0.0357	-0.136	0.0347	39.85
	[0.016]	[0.117]	[0.195]	[0.0997]	[0.108]	[0.0214]	[3,708]
Job search duration after graduation				0.0414	-0.0275	0.00636	-2,629**
				[0.0263]	[0.0290]	[0.00626]	[1,046]
Permanent job						0.169***	-13,060**
						[0.0310]	[5,130]
Managerial function						0.0300	14,926***
						[0.0306]	[5,282]
Public sector						0.000497	-6,549
						[0.0247]	[4,111]
Parents with academic tertiary education	-0.066***						
	[0.017]						
Constant	0.982***		8.284*			9.770***	266,228**
	[0.285]		[4.637]			[0.668]	[109,129]
Socio-demographic controls	yes	yes	yes	yes	yes	yes	yes
Study controls	yes	yes	yes	yes	yes	yes	yes
Observations	1,920	1,920	1,446	1,446	1,446	1,446	1,446
F-statistic: First Stage	16.09	16.09	14.15	11.19	11.19	11.03	11.03

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%; probit coefficients represent marginal effects; robust standard errors; instrument used: parents with academic tertiary education.

Source: Swiss Graduate Study 2000; own calculations.

In the longer term, the IV estimates show that most of the educational type effects disappear (table 6). The only exception is that vocational graduates have a lower probability of being unemployed than do academic graduates (column 1). Otherwise, the type effects are not statistically different. Therefore, vocational and academic graduates face the same job characteristics (columns 2 and 3), the same income expectations (column 4) and the same income variance (column 5).

Table 6: Educational type effects in the longer term: Instrumental variable estimates

		1. Unemployment Risk	2. Job Characteristics		3. Income	
	Vocational tertiary education	Unemployment Incidence	Permant Job	Managerial Function	Income (in logs)	Income Risk
	(1)	(2)	(3)	(4)	(5)	
	First Stage	IV-Probit	IV-Probit	IV-Probit	IV-Reg	IV-Reg
Vocational tertiary education		-3.071*	2.318	0.867	0.113	-6,198
		[1.821]	[1.420]	[1.149]	[0.156]	[41,194]
Social sciences	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
Business/Economics	0.032	-0.00304	0.682***	0.756***	0.118***	22,482***
	[0.024]	[0.206]	[0.167]	[0.119]	[0.0178]	[5,131]
Technical sciences	0.229***	0.875*	0.143	0.497**	-0.0337	2,509
	[0.024]	[0.456]	[0.288]	[0.230]	[0.0300]	[7,921]
Natural sciences	-0.110***	-0.0393	0.000351	0.291*	0.0209	8,632
	[0.023]	[0.275]	[0.207]	[0.175]	[0.0243]	[5,804]
Motivation	-0.013	-0.129*	0.0880	0.168***	0.0185***	2,527
	[0.009]	[0.0759]	[0.0651]	[0.0521]	[0.00700]	[1,919]
Local unemployment rate 2005	-0.053***	-0.179	0.0565	0.0120	0.00381	552.4
	[0.006]	[0.112]	[0.0995]	[0.0804]	[0.0106]	[2,779]
Stay abroad after studies	-0.051***	-0.199	0.0422	0.155*	0.0210*	3,267
	[0.016]	[0.161]	[0.118]	[0.0897]	[0.0120]	[3,367]
Employer change	-0.001	-0.248**	0.0162	0.0120	-0.00978	3,481
	[0.014]	[0.113]	[0.0954]	[0.0724]	[0.00931]	[2,573]
Experience after graduation	-0.029***	-0.575***	0.151*	0.140*	0.0375***	2,231
	[0.008]	[0.0751]	[0.0893]	[0.0718]	[0.00970]	[2,279]
Permanent job					0.128***	-7,737*
					[0.0185]	[4,411]
Managerial function					0.0556***	5,337*
					[0.00971]	[2,729]
Public sector					0.00208	-1,402
					[0.0120]	[2,988]
Parents with academic tertiary education	-0.067***					
	[0.016]					
Constant	1.158***				10.30***	-8,525
	[0.357]				[0.334]	[92,974]
Socio-demographic controls	yes	yes	yes	yes	yes	yes
Study controls	yes	yes	yes	yes	yes	yes
Observations	1,920	1,920	1,446	1,446	1,446	1,446
F-statistic: First stage	16.74	16.74	14.05	14.05	14.42	14.42

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%; probit coefficients represent marginal effects; robust standard errors; instrument used: parents with academic tertiary education.

Source: Swiss Graduate Study 2000; own calculations.

Comparing the IV results with our first basic specification, we can again conclude that the type of tertiary education influences risk and return at career entry differently and that career entry of vocational graduates still compares favorably to that of academic graduates. Vocational graduates have a lower unemployment risk, a lower earnings variance and a higher earnings expectation. In the longer term, these initial educational type effects disappear. Moreover, the IV analysis shows a strong influence of parental educational background, emphasizing the socio-economic component of educational choices. Individuals choosing the vocational path because of their parents have attractive career opportunities upon graduating from vocational tertiary education.

6. Conclusions

In this paper, we analyze career entry and later labor market success after tertiary education and distinguish two types of education (i.e., vocational and academic) with equal standards but different approaches. As a theoretical framework, we can use Stiglitz's (1975) educational screening. We investigate how the type of tertiary education chosen influences individual career entry after graduation and if possible educational type effects still exist in the longer term.

Our empirical results show that the type of tertiary education chosen influences risk and return at career entry in different ways. Vocational tertiary education leads to a less risky career entry (in terms of unemployment risk, favorable job characteristics and wage variance), but also a less profitable one in monetary terms. However, when we account for endogenous educational choice and use parental academic tertiary education as an instrument, we find higher wage expectations with still lower risks for vocational graduates. Therefore, career entry of vocational graduates compares favorably to that of academic graduates. From screening theory's perspective, employers appear to favor tertiary education with a practice-oriented approach, as this reduces uncertainty about the employee's skills and abilities.

Analyzing educational type effects in the longer term, we find a different picture. Vocational and academic tertiary education graduates do not face different risks anymore (same unemployment risk or job characteristics), but income differences still exist. However, accounting again for endogeneity and intergenerational mobility, our IV estimates no longer show different type effects on income. Therefore, in line with the screening hypothesis, it appears that initial screening effects fade over time as, with experience, employers come to have better information about their employees' real productivity. Thus, the practical component of the curricula completed by vocational graduates is advantageous at career entry. Then, after some time in the labor market, academic graduates, who do not complete practically oriented studies, reach the same level as their vocational education counterparts.

Vocational tertiary education graduates often have a lower socio-economic background than academic graduates do. By completing vocational tertiary education, they can recoup their initial status through a less risky career path, opening the door to more de-

manding and interesting occupations. Thus, individuals with a lower educational background may encounter advantageous career prospects after graduating from vocational tertiary education. Therefore, attending a university of applied science is the natural career path for ambitious vocational secondary education graduates. Early tracking or early specialization thus still leaves attractive career options and does not constitute an irreversible training path. It appears that the universities of applied sciences in the German-speaking countries optimally meet the challenge of providing students with both the specific vocational skills they need to be productive at work and the general academic skills they need to be prepared for further learning. Therefore, vocational education provides a wide range of career choices.

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Appendix

Table A.1: Descriptive statistics

	All		Vocational Graduates		Academic Graduates	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Vocational tertiary education	0.30	0.46	1.00	0.00	0.00	0.00
Labor market outcomes						
Unemployment duration after graduation (months)	1.7	2.3	1.3	2.0	1.9	2.5
Employee with managerial function 2001	0.15	0.36	0.19	0.39	0.13	0.34
Employee with managerial function 2005	0.43	0.49	0.51	0.50	0.39	0.49
Permanent job 2001	0.72	0.45	0.87	0.34	0.65	0.48
Permanent job 2005	0.84	0.36	0.95	0.21	0.80	0.40
Annual wage 2001 (CHF)	73'369	16'883	74'900	11'059	72'703	18'828
Annual wage 2005 (CHF)	92'123	17'566	88'714	14'176	93'605	18'663
Socio-demographic controls						
Male	0.68	0.47	0.84	0.36	0.61	0.49
Age at graduation	26.7	3.4	25.7	3.0	27.2	3.5
Children in 2001	0.05	0.22	0.04	0.19	0.06	0.24
Children in 2005	0.19	0.39	0.16	0.37	0.20	0.40
Swiss nationality	0.92	0.26	0.95	0.22	0.91	0.28
Study controls						
Business/Economics	0.21	0.41	0.24	0.42	0.20	0.40
Social sciences	0.28	0.45	0.04	0.19	0.38	0.49
Natural sciences	0.18	0.39	0.08	0.27	0.23	0.42
Technical sciences	0.33	0.47	0.65	0.48	0.19	0.39
Duration of study (in terms)	10.28	4.12	6.28	0.87	12.02	3.75
Final grade	0.55	0.20	0.48	0.18	0.58	0.20
Former educational path						
Secondary vocational education	0.25	0.43	0.76	0.42	0.02	0.14
Secondary academical education	0.71	0.45	0.17	0.38	0.95	0.22
Secondary mixed education	0.02	0.14	0.04	0.20	0.01	0.09
Tertiary education	0.04	0.19	0.01	0.11	0.05	0.21
Career path						
Practical training during studies	0.37	0.48	0.25	0.44	0.41	0.49
Student employment (in years)	2.07	2.42	0.67	1.04	2.68	2.59
Stay abroad during studies	0.29	0.45	0.15	0.36	0.35	0.48
Stay abroad after studies	0.29	0.45	0.30	0.46	0.28	0.45
Civil service 2001	0.30	0.46	0.13	0.34	0.38	0.48
Civil service 2005	0.35	0.48	0.19	0.40	0.42	0.49
Experience after graduation	4.37	0.73	4.28	0.76	4.41	0.72
Employer change after graduation	0.59	0.49	0.56	0.50	0.61	0.49
Motivation						
Importance of a new challenge	4.18	0.76	4.16	0.69	4.18	0.79
Labor market controls						
Local unemployment rate 2001	1.80	0.77	1.55	0.58	1.90	0.82
Local unemployment rate 2005	3.95	1.23	3.53	0.95	4.14	1.29
Parental education						
Parents with academic tertiary education	0.24	0.43	0.12	0.32	0.30	0.46
Parents with vocational tertiary education	0.02	0.13	0.01	0.12	0.02	0.13
Parents with other higher education	0.28	0.45	0.33	0.47	0.26	0.44
Parents with vocational secondary education	0.35	0.48	0.43	0.50	0.32	0.47
Parents with academic secondary education	0.02	0.16	0.02	0.15	0.03	0.16
Parents with lower education	0.08	0.27	0.08	0.28	0.08	0.26

Source: Swiss Graduate Study 2000; own calculations.